Challenges in Assessing the Effects of Nutrients on Agricultural Streams: U.S. Geological Survey National Water-Quality Assessment (NAWQA) Program

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Nutrient enrichment is a leading cause of water quality impairment in the United States, with agricultural activities a major source of nutrients to surface waters. In 2001, the U.S. Geological Survey National Water-Quality Assessment Program began a study on the effects of nutrient enrichment on stream ecosystems in five agriculturally influenced study areas. Thirty independent, wadeable stream sites distributed along a gradient of nutrient conditions were selected in each study area. Sites were selected using geodata, predicted nutrient loads, measured nutrient concentrations, and stream habitat. Data collected included nitrogen and phosphorus concentrations, biological communities (algae and invertebrates), benthic and seston algal chlorophyll *a*, stream metabolism, and habitat. Riparian and land-use data were obtained using GIS procedures. Results from this study indicate a number of issues that need to be considered in agricultural streams: (1) nutrients and chlorophyll *a* often are weakly correlated due to physical and biological interactions; (2) biological community assessments may be complicated by limited reference streams and high variability; (3) agricultural streams can be nutrient saturated and habitat limited; and (4) agricultural streams often are heterotrophic and may have limited nutrient processing, resulting in high nutrient loading to downstream waterways.